PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in the Construction of Machines

I, MORTON SMITH, B.Sc., of "The Cedars", Acton Road, Long Eaton, Derbyshire, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention is for improvements in the construction of machines. Machines as present built have their working parts supported in the requisite interacting relation in a solid frame or bed plate, which is usually of cast or wrought metal, although sometimes this bed plate or frame consists of two or three comparatively solid castings rigidly bolted together. This form of construction has certain disadvantages. In the first place, the arrangement is generally such that the machines must be packed and transported, each as a complete unit, which leads to substantial freightage and tariff charges. In the second place, expensive patterns are required for the bed plates, which latter themselves are massive and expensive and necessitate intricate machining and fitting operations to provide the necessary bearings and other points of attachment for the working parts. Finally in the case of a series of machines arranged along a production line and adapted to perform successive operations upon identical articles passing in succession along the line, each machine must of necessity be a complete entity, with its own frame or bed plate, for it would be impracticable, owing to the size of the frame or bed plate required, to build the working parts of successive machines into one continuous length of bed plate. Because each machine necessitates its own frame or bed plate, the capital cost of each is correspondingly increased and the feasibility of replacing or altering any one machine in the succession is diminished.

The present invention has for its chief object to avoid these disadvantages and is especially concerned with machine lay-outs of the kind wherein machines are arranged in a succession each to perform repetition operations upon identical articles that are passed in a stream along the production line. The invention provides a method of constructing machines which consists in dispensing with the usual cast or wrought solid frame or bed plate and substituting therefor a lattice-like or skeleton frame-work, built up from bar-like members and clamping-brackets or lugs, and in utilising the said members as supports for the working parts of the machine, which parts are desirably mounted thereon, individually or separately but in their correct working relation, by clamping-brackets or lugs that are clamped to the said members. The working parts are referred to as being individually or separately mounted to indicate that they are assembled on the said frame-work one by one or in small sub-units so that the machine is actually built up in the frame-work in contradistinction to any arrangement in which a machine as a complete working entity is attached to a framework.

In the arrangement provided by the present invention, the framework is detachably built up from comparatively inexpensive interchangeable or similar parts, such as circular sectioned metal bars and split clamping-brackets or lugs. The framework is, therefore, light and may be erected by unskilled labour, and moreover may be transported in pieces for assembly at its destination, for the bars may be packed side by side in long packing cases and the brackets packed in quantities in other cases. In this manner freightage and tariff charges are reduced and in the case of a breakage the broken member is readily and inexpensively replaceable. Additionally, the framework may readily be extended to accommodate further working parts or machines and this is of importance in connection with a lay-out of the kind referred to hereinbefore, for all the machines may be built into the same continuous frame-work which itself is built up by connecting longitudinal bar-like members end to end and supporting them on uprights that are connected by transverse members. Thus the invention may be said to embrace the provision in a machine or machines of a lattice-like or skeleton framework comprising uprights, transverse and longitudinal members connect-

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ing them, split clamping-brackets or lugs securing said uprights and members together, and component working parts of the machine secured individually but in their interacting relation to the framework members by split clamping-brackets.

In the preferred construction of built-up machine framework according to this invention, there is a plurality of uprights arranged in two parallel lines, each upright consisting of a suitable length of circular section bar of steel or other metal, reduced in diameter at its lower end to spigot into a disc-like foot plate. The uprights in each line are connected by upper and lower outer longitudinal members, themselves consisting of circular section steel or like bars of the appropriate length. These longitudinals are clamped to the uprights by split clamping-brackets. That is to say, each bracket comprises a vertical sleeve, split longitudinally and provided with a transverse bolt hole in a suitable boss or lug to take a horizontal clamping bolt by which the sleeve may be clamped around the upright after the latter has been inserted into it. Integral with this vertical sleeve, there is a horizontal sleeve to receive the longitudinals. This sleeve may either be split longitudinally at one side whereat it is provided with two spaced vertical clamping bolts, but more desirably it is constructed in two halves, a bottom half of trough-like form integral with the vertical sleeve and a top half which consists of two trough-like caps. The two longitudinal members may be laid, with their ends abutting, in the lower half of the sleeve, and the caps placed in position (one over the end of each longitudinal) and secured by clamping bolts, of which there are two diametrically opposed bolts to each cap. By providing removable caps, it is possible to remove any longitudinal simply by lifting the upper cap, without disturbing the other component members of the framework. It will also be appreciated that the framework may be built up to any desired length by providing the requisite number of uprights and connecting them by longitudinals, the ends of which abut within the clamping brackets.

The rectangular side frames thus formed by the uprights and outer longitudinals are connected together by transverse members. These members also comprise circular section bars clamped in position by clamping brackets, although it is desirable that the uprights shall be connected together near the floor level by transverse beams of, say, cast iron. These beams are bolted at their ends to split brackets that are clamped to the uprights, each bracket comprising a vertical split sleeve and, integral therewith, a vertical plate formed with bolt holes for the attachment of the beam. The latter is desirably of I-section, machined at the edges of the flanges and along the upper surface of the top flange. On the central web there is a line of longitudinal slots, thereby providing for the attachment thereto in the desired position of certain machine components or auxiliaries, such as dust-extracting pipes and the like. The upper flange of the I is of more robust section than the lower flange, for it is formed longitudinally with an inverted T-shaped slot into which bolts may be inserted through apertures at the ends of said slots, these apertures being sufficiently enlarged to receive the bolt heads and to permit the bolts to be slid along so that their heads are received in the cross bar of the T and their stems project upwards through the vertical part thereof. Thus bearing blocks, for a line of drive shafting extending along in the base of the framework, may be bolted to the transverse beams or frame members. Other machine components may also be bolted thereto, such for example as an electric motor.

While this construction of beam is preferred for connecting the uprights near the base, circular section bars and split clamping-brackets are preferred for connecting the uprights transversely at higher levels. The brackets employed consist of a split sleeve adapted to be clamped around the upright or a longitudinal by a clamping bolt, and another split sleeve extending at right angles thereto and adapted to be clamped round the transverse bar. This second sleeve may (as in the brackets previously described) consist of an integral trough-like lower part and a removable cap.

The various interacting component parts of the machine, such as gear wheels and the like, may be connected in their appropriate working relation to the frame members hereinbefore described by means of split clamping-brackets. In general, however, it will be found desirable to secure these working parts to two inner (auxiliary) longitudinals that extend parallel with each other inside two outer longitudinals at the top of the framework, for by utilising appropriate lugs or clamping-brackets the height of these two inner longitudinals may be varied according to the arrangement required by the working parts and the relation that any one unit or machine incorporated in the framework bears to other units in-

corporated therein. [redacted]s been found convenient to mount these inner longitudinals on the upper transverse bars, which themselves extend across the frame immediately below the upper longitudinals and are secured thereto by split clamping-brackets. On each of the upper transverse members there is a split sleeve having an integral upstanding part or stem, the upper face of which is machined. There is a corresponding bracket clamped on each inner longitudinal, having a depending part or stem the lower face of which is machined and makes contact with the said upper face, the two brackets being bolted together. By providing brackets that differ only in the height of the projecting part or stem the height of the inner longitudinals may thus be adjusted.

As mentioned, the working parts of the machine are in the main secured to these inner longitudinals. The means of attachment comprise split clamping-brackets. These brackets may either be in the form of sleeves split longitudinally at one side and provided with a clamping screw, or they may consist of a trough and a cap similar to the arrangement hereinbefore mentioned. In either case, there is a projecting flange, lug, web or the like, the shape and character of which is dependent upon the nature and position of the working part which it is intended to support. Certain of the working parts, such as idler pulleys, etc., may actually be rotatably mounted on the frame members or inner longitudinals, as these members are of circular cross section.

Instead of mounting the electric motor for driving the machine on the transverse beams, the motor may be mounted on the top of the frame, either upon the longitudinals or upon transverse members provided for the purpose. Desirably, there are two spaced transverse bars connected at their ends by split clamping-brackets, of the kind hereinbefore described, either to the inner or outer longitudinals. The motor is mounted on these transverse bars, so that its position in the width of the frame may be adjusted by sliding it along them and its position in the length of the frame may be adjusted by sliding the transverse bars along the longitudinals. The motor may either be bolted on a plate which spans the transverse members and has integral split-brackets that are clamped around them, or it may be bolted to upstanding projections on split-brackets (similar to those on the brackets by which the inner longitudinals are supported from the transverse members).

It will readily be appreciated that this method of machine frame [redacted]ruction is extremely elastic. The frame may be built up to the required dimensions from simple interchangeable parts, and may be extended or added to as occasion requires. Longitudinal and transverse members may be inserted by means of clamping-brackets at any location and in any attitude determined by the required location of the working parts that are to be mounted on them by means of other clamping-brackets. The invention is capable of application to many diverse types of machines, but as examples of its application the following machines, which are themselves of novel construction, will now be described. These machines are a polisher, an end parer, a stamp, and a pointer, used in the manufacture of lead pencils and incorporated in a line of machines each effecting different production operations.

The polisher comprises a hopper, a cell for a cellulose or other paint, and means for discharging pencils from the base of the hopper through the cell, whereby they are coated with the liquid contained therein. The hopper comprises two V-like members arranged in parallel planes and having side flanges, the pencils being stacked horizontally between card members. These member are bolted to a base having, integral with it, two split clamping-brackets that are clamped on to the two inner longitudinal members of the machine frame. Also clamped to said members by means of integral split brackets, there is a depending casting having a vertical bore for the reception of a rotating shaft carrying at its upper end a crank disc. A connecting rod or link is attached to this disc and reciprocates a pair of pushers by which at each stroke two pencils are discharged from the base of the hopper over a feed plate. These pushers are of spring-loaded telescopic construction so that in the event of a jamb, the springs yield and no damage or breakage results. That is to say, there is a cross head to which the crank shaft is attached, which cross head has connected to it two sleeves guided in horizontal bores formed in a bracket clamped across the two inner longitudinals. These sleeves receive the ends of the pushers, but between the end of the pushers and the remote ends of the sleeves compression springs are introduced, so that if a pusher meets with undue resistance, it is forced into the sleeve against the action of the spring. The said depending casting also has a second vertical bore in which a second rotating shaft is mounted. This shaft has at its bottom end a gear meshing with similar gear at the bottom

end of the first shaft, and above it a skew gear or worm. The latter meshes with a skew gear or worm on a horizontal counter-shaft, which countershaft at one end is supported on a bearing attached to the base of the depending casting and at the other end, on the far side of the hopper, is supported in another bearing bolted to a like depending casting. On this drive shaft, there is a grooved pulley by which the shaft is driven by a double V-belt from a main drive shaft that extends beneath the frame and is driven by an electric motor. A clutch is also provided on the counter-shaft.

As the pencils are discharged over the feed table from the base of the hopper they are taken between upper and lower grooved feed rollers. These feed rollers are driven by means of skew gearing from the said remote end of the countershaft. The feed rollers are supported by the second-mentioned casting, which comprises a plate spanning the two longitudinals and clamped thereto by split lugs or sleeves. On this plate a casting is bolted which provides a bearing for a shaft which carries the two lower feed rollers and the skew gear driving it. Above this shaft there is a plumber block bearing for the shaft carrying the two upper feed rollers, the said upper pair of feed rollers being geared to the other pair by means of gears which are located between the rollers of each pair. Because the shaft for the upper feed rollers is supported in a plumber block bearing, an addition or out-board bearing is required for its remote end. This bearing is also of the plumber block type and is carried in an upstanding casting which is pivotally attached by means of a split camping-bracket to one of the inner longitudinals. Hence by slacking off the clamping screw and swinging this upstanding casting outwards access is obtained to the nuts at the ends of the two shafts by which the feed rollers and gears are secured to them.

The spacing of the upper and lower feed rollers is adjustable, against the action of compressing springs, by means of screws.

These feed rollers traverse the pair of pencils discharged from the base of the hopper through the cell. The latter consists of a small container pierced fore and aft in its end walls with apertures for the passage of the pencils, and above the said small container there is a large funnel in which a reserve of fluid is contained. The apertures are lined with packing rings of a somewhat resilient nature so that no leakage takes place past the pencils that are being forced through them. The said cell is also removably secured to the inner longitudinals by means of split clamping-brackets integral with or attached to it so that it may readily be removed and another cell, containing other colouring matter, substituted for it.

As the pencils are pushed out from the far end of the cell they fall on to a conveyor belt which runs transversely of the frame. This band passes over pulleys which with convenience may be freely mounted on one of the inner longitudinals. More desirably, however, in order that the upper operative lap of the band may assume a trough-like formation, the pulleys are mounted upon short downwardly converging spindles. The mounting of these spindles provides an excellent instance of the utility of the method of frame construction, herein applied, for by securing the spindles at their ends to transverse members by means of split clamping-brackets, the desired angles may be attained without such complicated machining operations as would be necessary were the spindles secured in any form of one-piece machine frame, for as will readily be understood the use of such a frame would necessitate boring holes at several different angles to receive the various shafts and spindles.

The stamping machine is located next in the production line after the polisher, its function is to stamp the name of the makers, the quality, and other information on the pencil.

This is effected by traversing a strip of gold or other metal foil between the periphery of the pencil and a stamp carrying the desired lettering, which stamp punches the letters out from the foil into the wood of the pencil. There is a hopper of similar construction to the other hoppers described herein and supported by split clamping-brackets above the two inner longitudinals. Beneath this hopper, there is a conveyor movable step by step by means of ratchet mechanism. This conveyor comprises two spaced discs having notches in their peripheries adapted to receive the pencils from the hopper, and as the conveyor is racked round the pencils are brought one by one to a clamping station whereat each pencil is supported by a stationary block that lies between the discs.

Beneath the inner longitudinals, there are again two lower longitudinals supported at their ends upon transverse members, and the bearings for the shaft of the convevor are supported by means of split brackets on these lower longitudinals. Similarly, the bed in which the stamp reciprocates is also supported there-

on, as well as the bearings for a crank shaft which reciprocates the stamp. The foil is fed downwards between the stamp and the periphery of the conveyor from an upper reel to a lower reel, the spindles for the reels being also supported by split brackets from the inner longitudinals, and means are provided for moving the foil downwards through a short distance preparatory to each forward stroke of the stamp.

If it is desired to impress certain wording on one side of the pencil without forcing the foil into it, then the rigid support block at the stamping station may be equipped with the necessary embossed lettering so that as the stamp moves forward against the pencil it forces the latter against the type block.

Next in succession is the end parer, the function of which is to clean the ends of the pencils (which have colouring matter applied to them in their passage through the polisher) and to pare them neatly. It consists of a hopper, similar to those already mentioned, supported on the two inner longitudinals by split clamping-brackets. Beneath this hopper there is a conveyor which consists of two notched discs spaced apart on a shaft at a sufficient distance to engage the ends of the pencils. Thus, as the pencils descend from the hopper, they fall into the notches in the two discs and are carried around thereby beneath a short curved fence, which holds them in position. Because the machine must be capable of dealing with various kinds of pencils, for example circular section pencils of two different sizes and hexagonal pencils, in each disc three kinds of notches are cut, viz. large semi-circular notches, half-hexagonal notches and smaller semi-circular notches, and attached to each disc there is an adjustable selector plate having notches in its periphery spaced apart by an amount equal to the spacing between the notches of one kind in the disc. Hence this selector plate may be so positioned on the disc that, for example, it covers the half-hexagonal and small semi-circular notches and only exposes the large semi-circular notches when round pencils of comparatively large diameter are to be dealt with. As the pencils are carried away from the base of the hopper by the conveyor, one end of each pencil is traversed across the face of a grinding drum. This drum grinds the paint off that end. Beyond the drum the pencils pass from beneath the arcuate fence, but are held in position in the conveyor by means of a belt which travels, at the same linear speed as the conveyor periphery over suitably disposed pulleys. While the pencils are engaged by this belt, their ends, which have been ground clean by the drum, are trimmed by a rotating knife which cuts off a slice a few thousandths of an inch thick. This cut may be a perfectly clean one and hence a sharp knife is essential. For this reason, means are provided, engaging the edge of the knife, to sharpen it as it rotates, which sharpener may consist of a hone or grinder rotatable about an axis at right angles to that of the knife. Shortly, after passing the knife the pencils pass beyond the range of the retaining belt and fall by gravity from the conveyor into a suitable receptacle. They are then returned to the hopper, and stacked therein in reverse manner so that the other end of each pencil is cleaned and pared.

The various shaft, such for example, as the shaft on which the conveyor is assembled, the shaft for the knife and the spindles for the pulleys over which the retaining belt runs may be supported in split clamping-brackets depending from the inner longitudinals. Desirably, however, there are two other longitudinals which are slung by means of split clamping-brackets below said longitudinals, and upwardly projecting brackets for supporting the conveyor shaft and knife shaft are clamped to these longitudinals. Similarly, supports for the two lower pulleys over which the retaining belt runs are clamped to the lower longitudinals in the desired attitude, while the supports for the two upper pulleys of the retaining belt may be clamped to one of the upper longitudinals.

The pointing machine comprises essentially a conveyor by which the pencils are transported past a rotating or travelling abrasive surface. Desirably there is a large drum over which, and over a smaller drum or idler, a garnet paper band travels, the said large drum being supported on a longitudinal shaft which is suspended by clamping brackets of the kind herein before referred to from one of two inner longitudinals, this longitudinal being interrupted to provide a gap in which the said drum rotates. These inner longitudinals are supported at their ends by split clamping-brackets upon transverse members that are likewise secured by split clamping-brackets to outer longitudinals or to the uprights to which the latter are attached. Also supported in clamping-brackets from the two longitudinals there are two spaced cross shafts, each carrying a chain sprocket and over these sprockets a conveyor chain runs. The upper lap of this chain passes beneath the delivery end of the hopper, so that its recessed links receive and transport the

pencils (the said pencils being in a horizontal, transverse, attitude) over a bed which engages and supports the ends of the pencils and past the drum over which the garnet band runs. As the upper lap of this chain is approximately on a level with the upper part of the periphery of the drum, it will readily be understood that the ends of the pencils that are engaged by the band are pointed. The garnet band is prevented from coming off the drum by small flanges at each edge thereof and hence the bed along which the pencils are taken by the conveyor is shaped to lift them over these flanges at the appropriate times. While they are on the conveyor, the pencils are engaged from above by a double travelling belt, for the purpose of which is to hold them firm and to rotate them. This belt runs over two pulleys, that are supported on clamping-brackets projecting upwards from the two inner longitudinals, and over an idler which is adjustably mounted on the hopper. For driving the belt there is a gear, carried on an arm or the like that swings about the centre of one of the pulley shafts, which gear meshes with a pinion on said shaft. Attached to the gear, there is a chain sprocket over which a chain runs from a like sprocket on the shaft of one of the conveyor sprockets. Hence, by moving the said arm about the pulley shaft, the chain tension may be adjusted. The conveyor sprockets are driven through worm gearing from a longitudinal drive shaft supported in bearings bolted or otherwise attached to the depending brackets that support the conveyor sprockets, which drive shaft is provided with a pulley and clutch by which it is driven by a belt from the main shaft in the base of the framework.

Both in order to facilitate the replacement of the abrasive band and for the purpose of adjustment, the drum aforesaid is movable transversely of the length of the conveyor. Therefore, its shaft (which extends parallel with the longitudinals) is secured to a sliding block which is slidably mounted on two transverse shafts of circular cross-section that are suspended beneath the inner longitudinals by means of split brackets clamped thereto, an adjusting screw being provided for determining the movement of the slider. The abrasive band is driven by means of a belt which engages a pulley on the main drive shaft and a pulley attached to that small drum over which the band runs.

The hopper is of similar construction to the other hoppers herein mentioned in that it is supported by split clamping brackets upon the two inner longitudinals and is provided with an agitator for agitating the pencils horizontally disposed in it so that these pencils descend one by one onto the conveyor. This agitator may be driven in any suitable manner, for example by means of a belt from the idler pulley which as hereinbefore mentioned, is mounted on the hopper.

From the description of these machines, which has been given by way of example, it will be appreciated that the invention is applicable to the manufacture of lead pencils, the whole series of machines being built up in the skeleton framework, and driven by multiple **V**-belts from the main drive shaft at the base of the frame, each machine being provided with a clutch. For example, starting at one end of the framework, there will be a colloid mill for grinding the lead. This mill comprises a vertical spindle having at its upper end a flat-topped disc. Above this disc there is a stationary ring or collar within which the material to be ground is inserted. This disc is supported by split brackets on two cross rails or longitudinals and the gap between it and the surface of the disc is adjustable by means of a screw. As the disc rotates the material is ground out through the gap. The motor, which is located at the lower end of the spindle, may similarly be supported upon transverse members or longitudinals. Next comes a kneeding which comprises a steam heated tank and a kneeding screw. This tank is slung between frame members and the kneeding screw is driven by means of a belt from a drive shaft which extends the full length of the framework in the lower part thereof.

The caking and extruding press is not included in the framework, although if desired a small machine for cutting off the leads to the required length as they are extruded may be included. The next operation is that of air drying the leads. The machine for effecting this comprises a large heated plate, suspended by split clamping-brackets from the frame longitudinals, and a shaft carrying a number of eccentrics, said shaft being also supported by clamping-brackets and driven by a belting from the main drive shaft. On each eccentric there is a connecting rod, the small end of which is provided with a gudgeon pin adapted to be dropped into a groove in a lug at the upper surface of a small perforated rectangular plate which is thus reciprocated over the heated plate. Quantities of leads are assembled on small plates and covered with a felt pad. Each plate is then placed on the drying plate, one of the perforated reciprocated plates superimposed

on the pad and the connecting rod dropped into position, after which the perforated plates are oscillated to and fro over the leads so that the latter are rolled to and fro and are kept straight while they are being dried. On removal from the drying machine, the leads are fired. For this purpose they are loaded into a hopper, from the bottom end of which they are discharged on to a jigging conveyor which carries them through a furnace. This conveyor consists of a pair of rods that extend through the furnace and are mounted at each end upon cranks. Along side these rods are fixed rods so that during rotation of the cranks the conveyor rods rise at the side of the fixed rods, move forward and then sink below them and the leads discharged on the conveyor rods are intermittently traversed in the furnace. The latter is supported on the longitudinals by means of split clamping-brackets, as are also the hopper, the shafts for the cranks, and the cooling tank into which the leads are discharged from the furnace. The crank shafts may be interconnected by a longitudinal shaft again supported by means of split clamping-brackets from one of the inner longitudinals, the said countershaft being driven by belting from the main drive shaft.

Next the leads are transported by a conveyor to a wax bath for ingesting, the said conveyor and bath being built into the frame work by means of split clamping-brackets. After the ingesting, the leads are ready for insertion by hand into grooves in wooden slats. These slats are grooved in a grooving machine which is built into the framework. It comprises in the main a conveyor or feed rollers, by which the wooden slats are delivered past a rotary cutter which forms in each slat a number, say six, parallel grooves for the leads. The various shafts and spindles of this machine are mounted by split clamping-brackets on the frame members, as are also the spindles for a gutted conveyor on to which the grooved slats are delivered. By this belt the slats are carried past a gluing station, at which glue is applied to the grooved surface. The leads are then inserted by hand and a similar grooved slat superimposed over them to make a complete block. These blocks are then removed, placed in a hydraulic press and while in the press are secured in small clamps. Each in its clamp, the blocks are laid aside to dry. When the glue is dried the blocks are removed from the clamps and again take their place in the production line. The first operation on them is to clean up the ends at which the leads are exposed. For this purpose the blocks are placed on a conveyor chain, which carries them through a gap between the peripheries of a pair of abrasive drums that rotate around vertical axes, the spacing of these drums being such that during their passage between them the ends of the blocks are ground. Again the necessary bearings for the conveyor and drum shafts are located on the longitudinal transverse members of the frame by means of split clamping-brackets.

The blocks then pass to a shaping machine by which they are divided into rough pencil-like cylinders. This machine is also built in the frame by means of the split clamping-brackets. It comprises a grooved rotating cutter under which the blocks are traversed and by which the upper surface of each block is cut into the form of six parallel semi-circular ridges. Each block passes over a similar cutter by which the under surface is cut in a similar manner. These two operations result in the separation of the block into the component rough pencils. These rough pencils are then reduced to a more accurate cylindrical form by means of a sand-papering machine. This machine comprises two abrasive belts, the upper laps of which travel obliquely across the frame over suitable support tables. The pencils in parallel disposition one behind the other are traversed over these belts and because of the obliquity of the latter are caused to rotate so that they are ground to the desired cylindrical form.

Thereafter the pencils pass through the four machines herein before described in greater detail and if necessary through other machines which fit them with ferrules and rubber tips.

The various machine units are therefore built into a long lattice-like framework, along the length of which a single drive shaft, driven by a motor at one end, extends. On the said framework conveyors may be provided for transporting the pencils or the component parts thereof from one unit to the next, and suitable dust-extracting pipes may be included in the base, thereby forming a compact assembly that may readily be erected, dismantled or altered.

If desired, one or more conveyors may be employed comprising a tray or trough having at each side lugs which are internally screw-threaded and co-operate with a pair of parallelly disposed threaded shafts which are suitably rotated to traverse the tray. Where the shafts are rotated in opposite directions same would have oppositely disposed threads, i.e. right hand threads on one shaft and

left hand threads on the other.

It is of course unnecessary that the framework be in one continuous length, as same may be interrupted at intervals to suit existing requirements or conditions. Also there may be spaces at intervals between certain of the machine units for enabling manual operations to be carried out and/or work stored or collected, and in said spaces work-tables or benches may be fixed and/or racks or other receptacles for the work or for articles or material employed in connection therewith.

By virtue of the fact that in the framework before-described components of identical construction or shape are employed at various positions, it will be appreciated that pattern making is minimised and the cost consequently considerably reduced.

Dated this 11th day of July, 1935.

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COMPLETE SPECIFICATION

Improvements in the Construction of Pencil Making Machines

I, MORTON SMITH, B.Sc., of "The Cedars", Acton Road, Long Eaton, Derbyshire, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is for improvements in the construction of pencil-making machines. Hitherto the working parts of such machines such as shafts, gears, and the like have been supported individually or in very small units in their requisite interacting relation in a solid frame or bed plate. This form of construction has certain disadvantages. In the first place, the arrangement is such that the machines must be packed and transported, each as a complete unit, which leads to substantial freightage and tariff charges. In the second place, expensive patterns are required for the bed plates, which latter themselves are massive and expensive and necessitate intricate machining and fitting operations to provide the necessary bearings and other points of attachment for the working parts. Moreover, insomuch as in the production of pencils a succession of different manufacturing operations have to be performed as the articles pass along the production line, it has been the invariable practice to employ a plurality of separate machines, each designed to effect a different manufacturing operation. By the use of the expression "separate machines" it is intended to indicate that each machine is a complete entity, with its own frame or bed plate, for as will readily be understood it would be impracticable, owing to the size of the frame or bed plate required, to build the working parts of successive machines into one continuous length of bed plate. Because each machine necessitates its own frame or bed plate, the capital cost of each is correspondingly increased and the feasibility of replacing or altering any one machine in the succession is diminished.

The present invention has for its chief object to avoid these disadvantages and is especially concerned with pencil-making machine lay-outs of the kind wherein machines are arranged in a succession each to perform repetition operations upon identical articles that are passed in a stream along the production line. It is based upon the use of a three-dimensional framework of knock-down construction.

Three-dimensional frames of knock-down construction have been proposed, both for mechanical toys and also for industrial purposes. Thus in Specification No. 5340/05 a belt conveyor is proposed consisting of spaced pairs of uprights of circular section each fixed at its top and bottom ends in an unsplit bore of a bracket having a split bore at right angles thereto, in which split bore a longitudinal framework member is frictionally clamped (there being two parallel horizontal upper longitudinals and two parallel lower longitudinals), and transverse shafts, serving as spindles on which the rollers for the belt rotate, extending between the upper longitudinals and between the lower longitudinals; these shafts are secured by set-screws or the like in the unsplit bores of clamping brackets each of which has another split bore at right angles thereto in which split bore one of the aforesaid longitudinals is clamped.

The present invention provides a pencil-making machine comprising a three-dimensional lattice-like or skeleton framework of knock-down construction consisting of bar-like framework members, viz. transversely and longitudinally spaced uprights and longitudinal and transverse members connecting them, split clamping brackets having two, split bores or sockets mutually at angles for receiving

said members and for connecting them frictionally to one another, and one or more other members which extend between and are frictionally clamped to selected of the aforesaid bar-like members and which carry a line of drive shafting or a source of driving power.

The term pencil-making machine is limited to the following machines:—a colloid mill for grinding the lead; a small machine for cutting off the leads to the required length, after they have been extruded; a machine for air-drying the leads; a slat-grooving machine; a sand-papering machine for cleaning up the ends of the slats after the leads have been inserted in the grooves and the slats stuck together; a shaping machine for dividing the slats into rough pencil-like rods; a sand-papering machine for reducing these rough rods to more accurate shape; a polisher; a stamping machine for applying lettering; an end-parer as hereinafter described; and a pointer. Additionally, conveyors by which the various parts, upon which the manufacturing operations are to be performed, are conveyed from one "machine" to another at certain stages may also be built into the frame. However, in view of the hereinafter detailed description of the application of this invention to the end-parer it is thought unnecessary to describe in great detail and to illustrate its application to the other pencil making "machines."

In order to achieve the full benefits of the frame construction provided by this invention it is necessary that the working parts of the machine shall be mounted on the framework members, individually or separately, but in their correct working relation, by split clamping-brackets that are clamped to said members. Furthermore there may be at least one working part rotatably mounted on a frame-member of circular section or mounted thereon for rotational adjustment.

As in the arrangement provided by the present invention, the framework is of knock-down construction, it may be detachably built up from comparatively inexpensive interchangeable or similar parts:—circular sectioned metal bars and split clamping-brackets or lugs. The framework is, therefore, light and may be erected by unskilled labour, and moreover may be transported in pieces for assembly at its destination, for the bars may be packed side by side in long packing cases and the brackets packed in quantities in other cases. In this manner freightage and tariff charges are reduced and in the case of a breakage the broken member is readily and inexpensively replaceable. Additionally, the framework may readily be extended to accommodate further working parts or machines, for effecting other pencil-making operations, and this is of importance, for substantially all the machines in a pencil-making production line may be built into the same continuous framework which itself is built up by connecting longitudinal bar-like members end to end and supporting them on uprights that are connected by transverse members.

In order that the invention may be better understood reference will now be made to the accompanying drawings, in which

Figure 1 is a perspective view of the framework portion of the pencil making machine.

Figure 2 is a section of a pedestal employed therein.

Figure 3 comprises two sections through a clamping-bracket employed in the frame.

Figure 4 is a section of a clip employed for attaching a transverse beam.

Figure 5 is a plan of one end of, and

Figure 6 is a section through, the said transverse beam.

Figures 7 and 8 each comprise two sections of further split clamping-brackets employed in the frame.

Figure 9 is a front elevation showing the manner in which the said frame is incorporated in a pencil-making machine, while

Figure 10 is a section on the line 10—10 in Figure 9, on a somewhat enlarged scale.

Throughout this description like reference numerals indicate like parts.

In the built-up frame illustrated of a pencil-making machine, there is a plurality of uprights 10, each upright consisting of a suitable length of circular section bar of steel or other metal, reduced in diameter at its lower end to spigot into a disc-like foot plate 11 (Fig. 2). The uprights 10 at each side of the frame are connected by outer longitudinal members 12, (which may be provided at upper and lower levels) themselves consisting of circular section steel or like bars of the appropriate length. These longitudinals 12 are clamped to the uprights 10 by split clamping-brackets 13 (Fig. 3). That is to say, each bracket comprises a vertical sleeve 13*a*, split longitudinally and provided with a transverse bolt hole in a suitable boss or lug to take a horizontal clamping bolt 14 by which the sleeve may be clamped around the upright 10 after the latter has been inserted into it. Integral with this vertical sleeve, there is a horizontal

sleeve 13*b* to receive the longitudinals. This sleeve may either be split longitudinally at one side whereat it is provided with two spaced vertical clamping bolts, but more desirably it is constructed in two halves (and may therefore be considered as being split), a bottom half of trough-like form integral with the vertical sleeve and a top half which consists of two trough-like caps. Two longitudinal members such as 12 may be laid, with their ends abutting, in the lower half of the sleeve, and the caps placed in position (one over the end of each longitudinal) and secured by clamping bolts 15, of which there are at least two diametrically opposed bolts to each cap. By providing removable caps, it is possible to remove any longitudinal simply by lifting the upper cap, without disturbing the other component members of the framework. It will also be appreciated that the framework may be built up to any desired length by providing the requisite number of uprights 10, arranged in two parallel planes, and connecting them by longitudinals 12, the ends of which abut within the clamping brackets.

The rectangular side frames thus formed by the uprights 10 and outer longitudinals 12 are connected together by transverse members 16 (Fig. 1). These members also comprise circular section bars clamped in position by clamping brackets, although it is desirable that the uprights shall be connected together near the floor level by beam members 17 (Fig. 1), which may be made of cast iron. These beams are bolted at their ends to split brackets 18 (Fig. 4) that are clamped to the uprights, each bracket comprising a vertical split sleeve 18*a* and, integral therewith, a vertical plate 18*b* formed with bolt holes for the attachment of the beam. The latter is desirably of I-section, machined at the edges of the flanges and along the upper surface of the top flange On the central web there is a line of longitudinal slots 24 (Fig. 6), thereby providing for the attachment thereto in the desired position of certain machine components or auxiliaries, such as dust-extracting pipes and the like. The upper flange of the I is formed longitudinally with an inverted T-shaped slot 19 into which bolts may be inserted through apertures 19*a* (Fig. 5) at the ends of said slots, these apertures being sufficiently enlarged to receive the bolt heads and to permit the bolts to be slid along so that their heads are received in the cross bar of the T and their stems project upwards through the vertical part thereof. Thus bearing blocks 20, for a line of driveshafting 21 extending along in the base of the framework, may be bolted to the transverse beams or frame members as illustrated in Figs. 6 and 9. Other machine components may also be bolted thereto, such for example as an electric motor.

While this construction of beam is preferred for connectiig the uprights near the base, circular sections bars 16 and split clamping-brackets 22 (Fig. 7) are preferred for connecting the uprights transversely at higher levels. The brackets employed consist of a split sleeve adapted to be clamped round the upright 10 or a longitudinal 12 by a clamping bolt, and another split sleeve 22*b* extending at right angles thereto and adapted to be clamped round the transverse bar 16. This second sleeve may (as in the brackets previously described and illustrated in Fig. 3) consist of an integral trough-like lower part and a removable cap.

The various interacting component parts of the machine, such as gear wheels and the like, may be connected in their appropriate working relation to the frame members hereinbefore described by means of split clamping-brackets. In general, however, it will be found desirable to secure certain of these working parts to two inner (auxiliary) longitudinals 30 that extend parallel with each other inside two outer longitudinals 12 at the top of the framework, for by utilising appropriate lugs or clamping-brackets the height of these two inner longitudinals may be varied according to the arrangement required by the working parts and the relation that any one unit or machine incorporated in the framework bears to other units incorporated therein. It has been found convenient to mount these inner longitudinals 30 on the upper transverse bars 16, which themselves extend across the frame immediately above (or below) the upper longitudinals 12 and are secured thereto by split clamping-brackets 22.

There are also auxiliary longitudinals 31 spaced apart to a greater extent than the inner longitudinals 30 and supported from the transverse members 16 by uprights 32. These members 31 may be connected to the uprights 32 and the latter to the transverse member 16 by split clamping-brackets 22 such as are shown in Figure 7, or by split clamping brackets 33 such as are shown in Figure 8. It will be noticed that the clamping-bracket 33 has one split socket 33*a* and a second split bracket 33*b* abutting thereon, such brackets may also be used for connecting any other of the frame members at right

angles.

It will readily be appreciated that this method of machine frame construction is extremely elastic. The frame may be built up to the required dimensions from simple interchangeable parts, and may be extended or added to as occasion requires. Longitudinal and transverse members may be inserted by means of clamping-brackets at any location and in any attitude determined by the required location of the working parts that are to be mounted on them by means of other clamping-brackets. The invention is capable of application to many diverse machines employed to effect the successive operations in the manufacture of pencils, but as an example its application to an end-paring machine will be described in detail with reference to Figs. 9 and 10. This machine comprises two spaced conveyor discs 40 secured to a shaft 41 that is journalled at the upper end of brackets 42 clamped upon the inner longitudinals 30. This permits the spacing of the discs 40 to be adjusted in accordance with the length of the pencils 44, the ends of which are to be ground. These pencils are shown as being of circular cross section and are discharged from a hopper 45 in which they are stacked into notches 46 in the peripheries of the discs, the said conveyor discs rotating past the base of the hopper. Actually in each kind of disc various kinds of notches may be cut appropriate to the section of the pencils to be dealt with. For example in each disc there may be three kinds of notches, large semi-circular notches, half-hexagonal notches and smaller semi-circular notches, and attached to each disc there may be an adjustable selector plate having notches in its periphery spaced apart by an amount equal to the spacing between notches of one kind in the disc. Hence this selector plate may be so positioned on the disc that for example it covers the half-hexagonal and small semi-circular notches and only exposes the large semi-circular notches when round pencils of comparatively large diameter are to be dealt with.

The hopper 45 comprises parallel end plates 45*a*, 45*b* the said end plates having inwardly directed flanges along their side edges. These end-plates are adjustable towards and away from each other in accordance with the length of the pencils to be stacked therein, and for this purpose the end-plate 45*a* is attached to a hopper bar 46 which spans, and is adjustably clamped to, the auxiliary longitudinals 31 and the plate 45*b* is secured to a similar hopper bar 47 which is cranked for the purpose hereinafter mentioned. The hopper contracts towards its base to a narrow neck and in this neck there is an upwardly extending plate 48 which is adjustable to adapt the width of the neck to the diameter or thickness of the pencils dealt with. At the upper part of the said neck there is an agitator 49 mounted upon a shaft 50 that is driven by a cross belt 51 from a pulley 52 on a shaft 53.

This shaft 53 is carried on an upstanding bracket 43 adjustably clamped to the inner longitudinals 30 and drives the conveyor through gears 54, 55. It is itself driven from the main shaft 21 by a belt or the like 55, and pulleys 56, 57 upon a counter-shaft 58. This counter-shaft is supported in a bracket 59 that depends from and is clamped to the inner longitudinals 30. From the pulley 57 a further belt 60 extends upwards to a large pulley 61 on the shaft 53. The said pulley adapted to be connected to the shaft by a clutch 62 operated by a handle 63.

The conveyor rotates in anti-clockwise direction as viewed in Figure 10 and carries the pencils loaded into it beneath two retaining bands 64 which are spaced about by an amount equal to the spacing of the discs 40. Each of these retaining bands runs approximately half-way round the conveyor periphery and over certain pulleys. These pulleys include a pair of jockey pulleys 65 that are rotatably journaled on one of the inner-longitudinals 30 (that inner-longitudinal which is immediately below the shaft 41), further jockey pulleys 66 which are rotatable upon an eccentric 67 adjustably clamped on one of the main longitudinals 12 so that the belt tension may be adjusted by rotating the eccentric, another pair of pulleys 68 rotatable on one of the auxiliary longitudinals 63, and further swivelling jockey pulleys 69. The latter are carried at the end of a forked arm 70 pivotally adjustable about said longitudinal 31, and in order to adjust it there is another arm 71 clamped to the said longitudinal and provided with an adjustment screw 72 engaging the underside of the arm 70.

Also adjustably clamped to the longitudinal 31 there is a split depending arm 73 which at its lower end rotatably supports a shaft 74. This shaft carries an emery disc 75 so located that the left-hand ends (Figure 9) of the pencils gripped between the conveyor and the retaining band 64 are carried across its periphery and are ground flush. This grinding operation exerts an end-thrust on the pencils (tending to move them axially) and the said thrust is resisted by a curved

plate 76 that is adjustable by means of a screw 77 carried in an arm 78 depending from and clamped to the aforesaid auxiliary longitudinal 31 by a bracket such as 33 (Fig. 8). Additionally the forked bracket 73 is adjustable along the said longitudinal 31, after its clamping bolts have been slacked off, by means of a screw 79 carried in an arm 80 also clamped to the longitudinal. It is to avoid the bracket 73 that the hopper bar 47*b* is cranked, and one end of said bar may be integral with the arm 80.

The sand-papering disc is enclosed within a cowling 81 having an outlet 82, and the outer face of the disc may be provided with vanes 83 for directing the dust outwards. The shaft 74 of the sand-papering disc is driven by a belt 84 from an electric motor 85 slung by means of a split clamping-bracket 86 from one of the longitudinals 12, and the belt tension may be adjusted by rotating said bracket 86 on the longitudinal.

The ends of the pencils are therefore ground flush, and when they reach the bottom of the conveyor (whereat the bands 64 leave the conveyor periphery) they are released and fall onto a chute 86 which conducts them to a tray 87. If the other end is to be ground the pencils are removed from this tray and returned to the hopper 45 after having been reversed end for end.

Various machine units such as hereinbefore described may be built into a long lattice-like framework along which longitudinal-members extend end to end, the abutting ends being received in brackets such as 13. Such a framework may be provided with a single drive shaft such as 21 extending along its length and driven by a motor at one end.

It is of course unnecessary that the framework be in one continuous length, as same may be interrupted at intervals to suit existing requirements or conditions. Also there may be spaces at intervals between certain of the machine units for enabling manual operations to be carried out and/or work stored or collected, and in said spaces work-tables or benches may be fixed and/or racks or other receptacles for the work or for articles or material employed in connection therewith.

By virtue of the fact that in the framework before-described components of identical construction or shape are employed at various and variable positions, it will be appreciated that pattern making is minimised and the cost consequently considerably reduced.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A pencil-making machine comprising a three-dimensional lattice-like or skeleton framework of knock-down construction consisting of bar-like framework members, viz. transversely and longitudinally spaced uprights and longitudinal and transverse members connecting them, split clamping brackets having two, split bores or sockets mutually at angles for receiving said members and for connecting them frictionally to one another, and one or more other members which extend between and are frictionally clamped to selected of the aforesaid bar-like members and which support a line of drive shafting or a source of driving power.

2. A machine according to Claim 1, having working parts mounted on the framework members, individually or separately, but in their correct working relation, by split clamping-brackets that are clamped to said members.

3. A machine according to Claim 2, having at least one working part rotatably mounted on a frame-member of circular section or mounted thereon for rotational adjustment.

4. A machine according to any of the preceding Claims, wherein each said other member is formed with a plurality of longitudinally extending slots for the adjustable connection thereto of bearing blocks or other machine components.

5. A machine according to Claim 3, wherein each other member is provided with a longitudinal slot of inverted T-section, substantially as described with reference to Figs. 5 and 6.

6. A machine according to any of the preceding Claims, wherein the framework members are connected one to the other by brackets that are adjustable longitudinally of them.

7. A machine according to any of the preceding Claims, having rotatable shafts or other members journalled in brackets clamped in the desired relation to the framework members.

8. The subject-matter of any of the preceding Claims, in which the knock-down framework is extended, to accommodate a plurality of successive machines performing different pencil-making operations in a production line, and includes successive longitudinal framework members clamped end to end.

9. The subject-matter of Claim 8, including a drive shaft, for the several machines, extending longitudinally of the framework and supported on the members thereof.

10. The subject-matter of Claim 8 or

Claim 9, wherein the adjacent ends of each pair of successive longitudinal members are received within the same clamping bracket.

11. A pencil-making machine, having a frame substantially as described herein.

Dated this 9th day of September, 1936.

ERIC POTTER & CLARKSON,
Chartered Patent Agents,
London and Nottingham.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1937.

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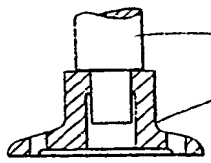


Fig. 2.

Fig. 1.

Fig. 7.

Fig. 3.

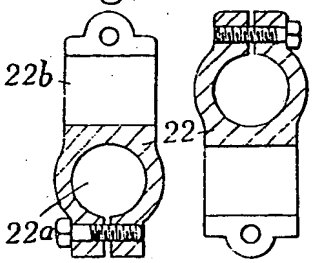


Fig. 8.

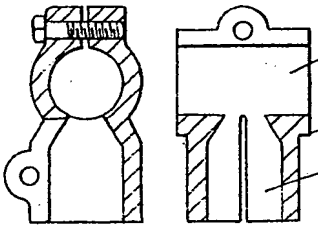


Fig. 6.

Fig. 5.

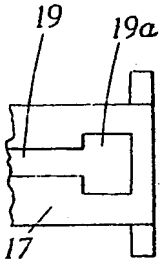
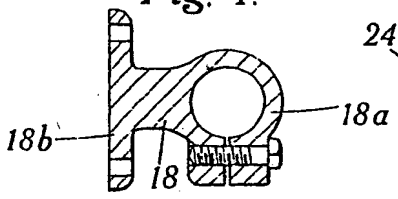
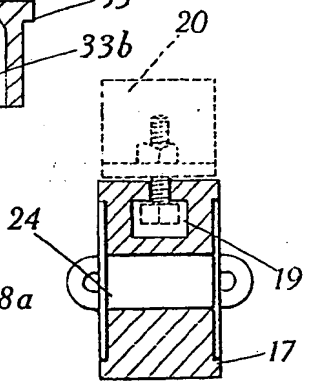


Fig. 4.





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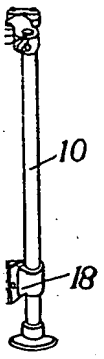

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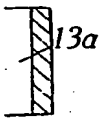

Fig. 6.

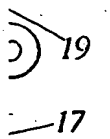

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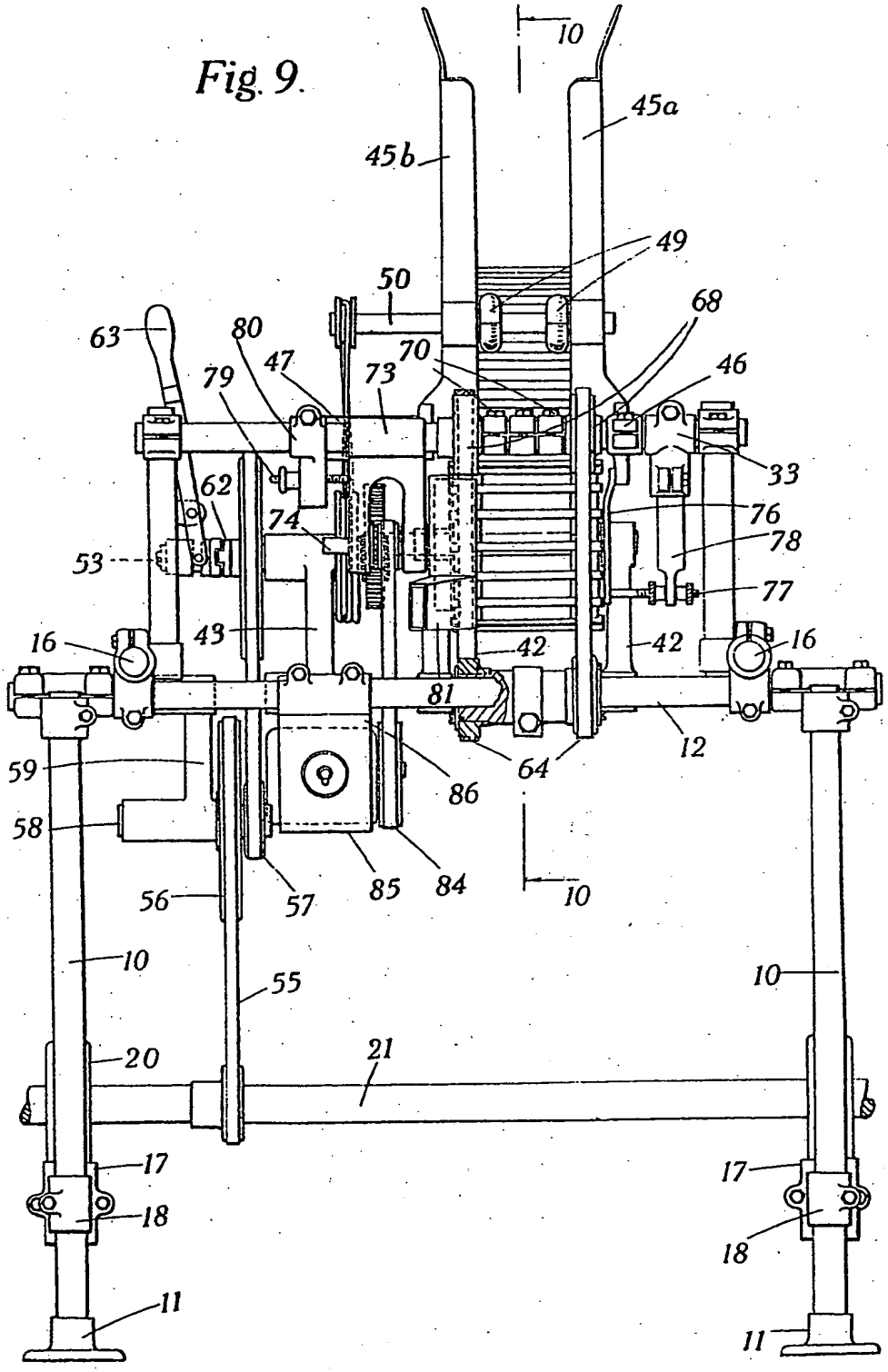
Fig. 9.



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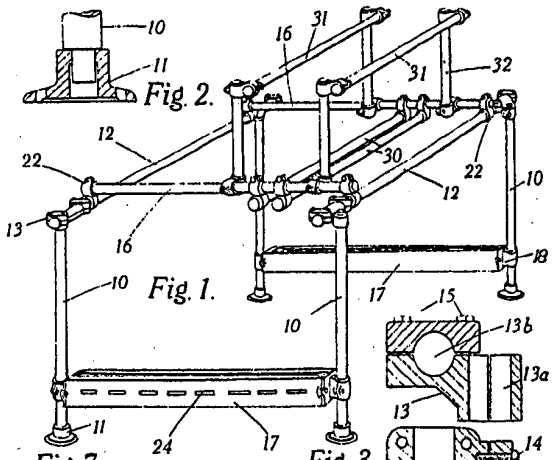


Fig. 2.

Fig. 1.

Fig. 3.

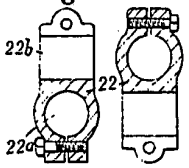


Fig. 7.

Fig. 8.

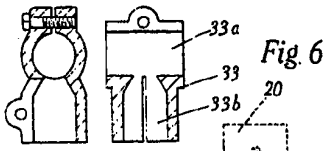
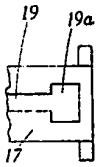


Fig. 6



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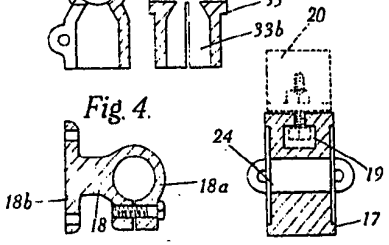

Fig. 4.

Fig. 9.

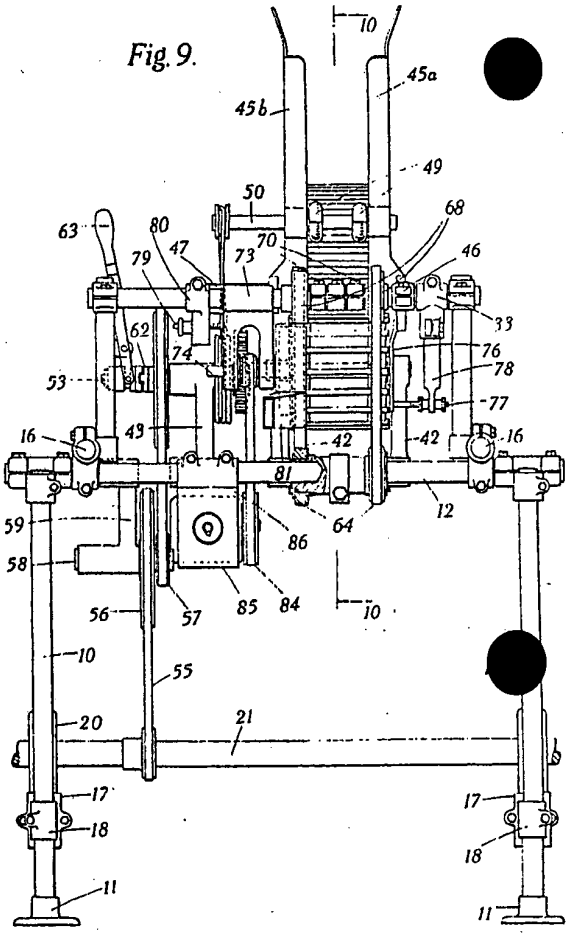

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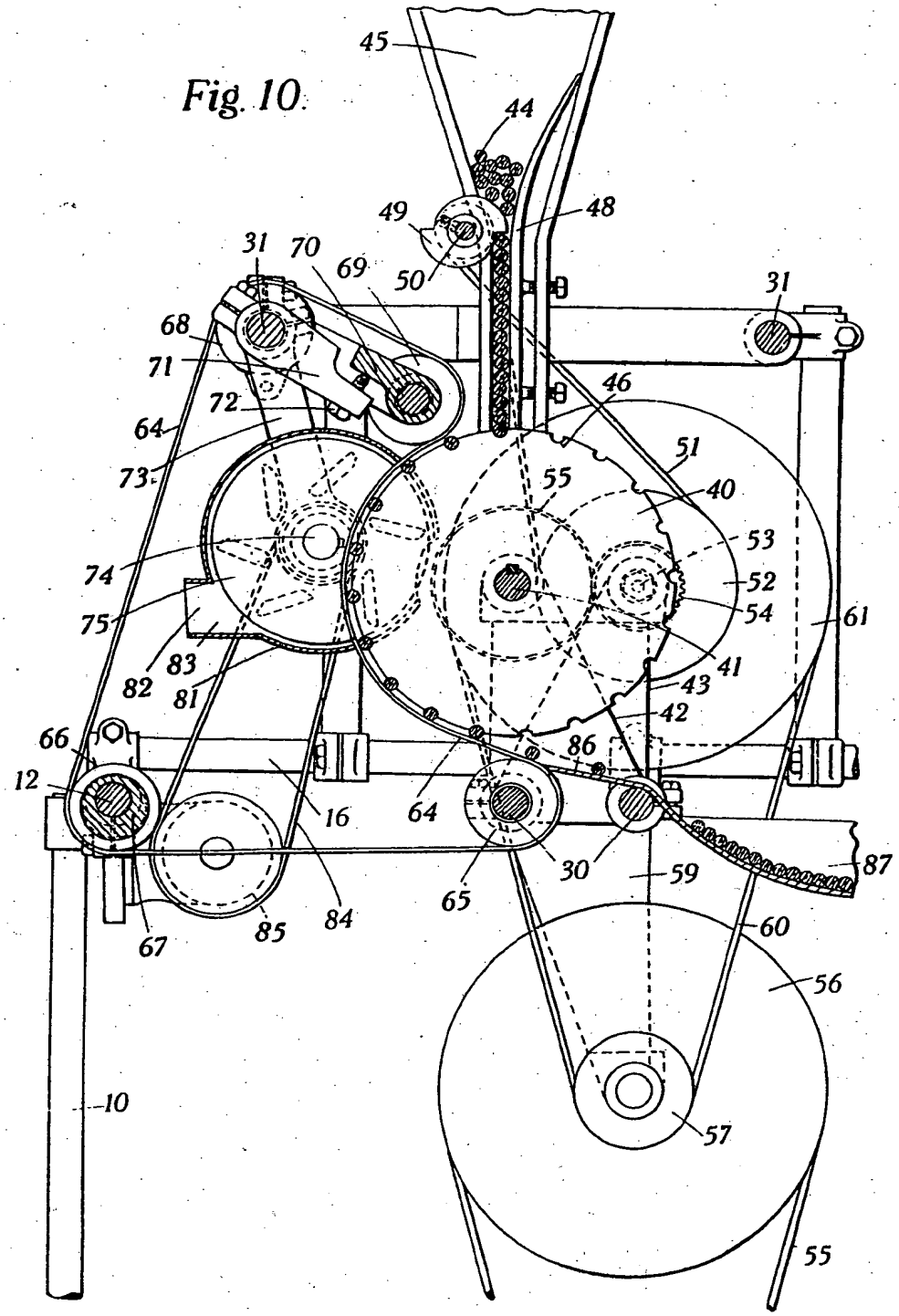
Fig. 10.



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